

## CLAIMS

1. A single layer microfluidic fluid mixer comprising:  
a fluid routing device having:  
5 a first channel having a cross-section of a first aspect ratio and a first depth; and  
a second channel having a second cross-section of a second different aspect ratio and a second different depth, wherein the second channel intersects with the first channel from a first location to a second location, the first and second locations  
10 having different transverse positions within the first channel; and  
fluid supply means for supplying to each channel fluid to be mixed.
2. A single layer microfluidic fluid mixer comprising:  
a fluid routing device having:  
15 a first channel having a cross-section of a first aspect ratio and a first depth and having a longitudinal axis; and  
a second channel having a cross-section of a second different aspect ratio and a second different depth, wherein the second channel passes through at least part of the first channel in a direction transverse to the longitudinal axis; and  
20 fluid supply means for supplying to each channel fluid to be mixed.
3. A mixer according to either claim 1 or claim 2, wherein the cross-section of the intersecting first and second channels is T-shaped.
- 25 4. A mixer according to any one of the preceding claims, wherein the first and second channels are elongate in cross-section.
5. A mixer according to any one of the preceding claims, wherein the aspect ratio of the first channel is a 90° rotation of the aspect ratio of the second channel.  
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6. A mixer according to any one of the preceding claims, wherein the first and second channels have substantially the same cross-sectional area.
7. A mixer according to any one of the preceding claims, wherein the total cross-  
35 sectional area of the first and second channels is substantially constant.

8. A mixer according to claim 1, wherein the aspect ratios of the two channels are in the range between 1.5:1 and 10:1.
9. A mixer according to claim 8, wherein aspect ratios of the two channels are in the range between 3:1 and 6:1.
10. A mixer according to any one of the preceding claims, wherein the second channel is separate from the first channel until the first location.
11. A mixer according to any one of the preceding claims, wherein the second channel continues beyond the first channel after the second location.
12. A mixer according to any one of claims 1 to 9, wherein the second channel extends only between the first and the second location.
13. A mixer according to any one of the preceding claims, wherein the second channel is formed by a gradual change in aspect ratio from the first location.
14. A mixer according to any one of the claims 1 to 12, further comprising, at the first location, a step which signifies the start of the second channel.
15. A mixer according to any one of claims 1 to 11 and 13 and 14 when not dependent upon claim 10, further comprising, at the second location, a step which indicates the end of the second channel.
16. A mixer according to any one of the preceding claims, wherein the first and second channels have flow directions which are at 90° to each other.
17. A mixer according to any one of claims 1 to 13, wherein the first and second points are at different longitudinal positions in the first channel.
18. A mixer according to claim 11, wherein the first and second channels are recombined.
19. A mixer according to claim 18, wherein the first and second channels pass through a respective intermediary channel prior to recombination.

Amended  
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20. A mixer according to claim 19, wherein the intermediary channels have the same aspect ratio cross-section.

5 21. A mixer according to any one of the preceding claims, further comprising additional fluid routing devices connected in series.

22. A mixer according to any one of the preceding claims, further comprising a pair of inlet passages for supplying, in use, different fluids to the first channel.

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23. A mixer according to claim 22, further comprising a geometric pin between each of the fluid supply passages and the first channel.

24. A method of mixing fluid in a single layer, the method comprising the steps of:  
15 supplying a fluid to a first channel having a cross-section of a first aspect ratio;  
supplying a fluid to a second channel which has a cross-section of a second different aspect ratio and which intersects with the first channel from a first location to a second location, each location having a different transverse position within the first channel;

20 passing a portion of the fluid from the first channel into the second channel;  
moving the fluid through the second channel from the first point to the second point; and  
recombining the fluid from the second channel into a different portion of the fluid in the first channel.

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25. A method according to claim 24, further comprising the step of passing the fluid from the first and the second channel into respective intermediary channels, each of which has the same aspect ratio cross-section, prior to recombining the fluids from the first and the second channels.

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